The Prognosis in Cataract Operations

A Correlation of Preoperative Appraisal with Results

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• The preoperative and postoperative data on 500 cases in which cataracts were removed from the eyes were reviewed to correlate the results with the preoperative prognosis as determined by light identification and macular function tests. Another purpose was to consider the adequacy of various methods of preoperative appraisal.

The vision was improved to better than 20/200 in 89.4 per cent of the cases. In 5.6 per cent (28 cases) vision was improved but was 20/200 or less. In 5 per cent (25 cases) the operation was a failure, for various causes.

There was wide variation in methods used to determine the condition of the retina preoperatively by means of light identification and macular function tests, and there was no uniformity of terms used to describe degree of function.

A standardized method of estimating retinal function in the presence of cataract was used in 60 cases. The equipment used is simple and inexpensive. From analysis of preoperative determination of prognosis and the operative results, it would appear that this simple inexpensive procedure is more reliable in arriving at a preoperative prognosis than some of the methods frequently employed.

IN 1939 the California State Legislature passed Section 3051 of the Welfare and Institutions Code authorizing the Department of Social Welfare to "provide treatment or operations to *prevent blindness* or *restore vision* to applicants for, or recipients of, Aid to the Blind . . ." The law states that, "This service shall be extended *only* to *those persons whose age* and *physical* and *mental condition* will *make such physical rehabilitation profitable to the individual.*"

The State Ophthalmologist is responsible for carrying out the intention and objectives of the law.

It therefore became a preoperative requirement to establish a prognosis indicating "preservation of vision" or "restoration of vision" before free treatment could be authorized.

Various methods of establishing a prognosis in the presence of cataract have been reported in the ophthalmological literature. The methods receiving the greatest recognition are those that were described by Duke-Elder,[1] Fuchs[2] and Young.[3] In all three methods, ability to distinguish points of light in various fields is used as a test of macular function.

In an effort to determine current procedures among California ophthalmologists, the author reviewed 500 preoperative reports on eyes from which cataracts were subsequently removed and compared them with the postoperative reports. The patients were all operated upon at the expense of the California State Department of Social Welfare. In 25 cases (5 per cent) useful vision was not restored. Of those operated on, 89.84 per cent had visual acuity of better than 20/200 90 days after operation. Five and six-tenths per cent had visual acuity of 20/200 or less but vision was improved enough to enable the patients to care for their personal needs.

The survey noted specifically the preoperative estimate of macular function and the method employed in making such estimate, as well as the method used in reporting "light projection," the compass of the visual field in which the direction of points of light can be seen. An effort was made to correlate the postoperative visual results and the condition of the fundus observed 90 days after operation with the preoperative report of macular function and light projection.

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Thirty surgeons, all diplomates of the American Board of Ophthalmology, participated in the surgical program. They reported on macular function in 484 eyes and on light projection in 417 eyes. Light projection was determined in most cases by the use of the ophthalmoscope light, although a few noted the use of a small flash light. Macular function was determined by the use of two points of light or a combination of two or more points of light, one of them red. Occasional examiners (not surgeons) questioned the value of the two-point light test. There was no uniformity or standardization of methods of making these tests or of terminology of reporting results.

The various terms used to describe light projection and the number of cases described by each term are listed in Table 1. Table 2 gives similar data with regard to reporting of macular function.

TABLE 1.—*The various terms used in recording light projection and the number of cases described by each term*

Measured in degrees	186	Limited	2
Full	138	Questionable	4
Normal	35	Uncertain, faulty or impaired	3
Good	27	Nasal defect	1
Accurate	4	Not sufficient	1
Excellent	4	No report	83
Satisfactory	6		
Fair	5		
Restricted	2	Total	500

TABLE 2.—*Terms used to record macular functions and the number of cases described by each*

Distance between two lights when separation was first recognized. (No indication as to distance the lights were from eyes)	162	Prompt	9
Distance between two lights when separation was first recognized, together with the distance from the eyes	116	Fair	6
Good	34	Poor	8
Normal	30	Doubtful, questionable or uncertain	9
Satisfactory	8	Defective	1
Present	6	Two lights horizontal	1
Excellent	7	Measured in degrees	6
Positive	4	1-2-4° red and white	39
		Separation of red and white	21
		Impossible, absent, or "too dense"	17
		No report	16
		Total	500

POSTOPERATIVE VISUAL RESULTS

Failure to improve vision (Table 3) occurred in 25 of the 500 cases. Twelve of the failures were owing to ocular complications occurring at or subsequent to operation (Table 4). Preoperative determinations of macular function and light projection in these 12 cases were not pertinent to the final outcome.

Thirteen of the failures (Table 5) were owing to pathologic conditions that apparently were present before operation. Four of the patients had glaucoma. Macular function and light projection were not recorded in one case and were recorded as "good" or "normal" in two cases. They were described by measurements in only one case (Case 24) but the two-point light differentiation at 10 mm. without indication of the distance from the eye provided no information upon which to estimate the extent of functioning retina in the macular area. Light projection, reported as 125° in that case, should indicate only moderate restriction of the visual fields. However, postoperative findings did not substantiate this. Visual acuity before operation was 20/100; after operation there was light perception only. It is possible that this reduction in vision could be attributed to the surgical procedure.

TABLE 3.—*Data on operations considered failures*

Case No.	Age	Visual Acuity		Pathologic Condition*		Macular Function**	Light Projection†
		Preop.	Postop.	Postop. Eye	Preop. Systemic		
1	82	1/200	5/200	670	74	1 inch	80°
2	64	H.M.	3/200	620	72	Normal	Normal
3	89	L.P.	No L.P.	130		Normal	80°
4	79	20/200	20/200	660		5 mm. at 2 ft.	130°
5	75	L.P.	L.P.	420	72	‡R&W 1-2-4°	Good
6	71	L.P.	No L.P.	110			
7	72	20/400	20/400	110		Normal	Normal
8	74	H.M.	L.P.	121		Normal	70°
9	68	L.P.	L.P.	650		2 cm.	Full
10	86	L.P.	L.P.	420		Normal	Normal
11	67	H.M.	L.P.	420-110		3 cm.	Full
12	77	L.P.	L.P.	Died		Good	Good
13	64	L.P.	L.P.	640			
14	72	L.P.	No L.P.	330		Good	Good
15	69	L.P.	L.P.	110		Good	Normal
16	81	H.M.	H.M.	670	74	2 lts. horizontal	
17	71	C.F.	No L.P.	650	72-74	Present	80°
18	60	L.P.	L.P.	640	72	No	120°
19	77	L.P.	L.P.	420	72-74	Present	
20	79	L.P.	C.F.	670		Good	
21	67	L.P.	L.P.	650		3 inches	120°
22	62	10/200	L.P.	640		1 cm.	100°
23	69	L.P.	L.P.	650		5 cm.	130°
24	71	24/100	L.P.	110		10 mm.	125°
25	64	20/200	L.P.	Epithelial Ingrowth		1 cm. at 1 m.	Normal

*Numbers under columns headed "Pathologic Condition" are in accord with the Standard Classification of Causes of Blindness published by the Federal Security Agency: 110=Glaucoma, 130=Panophthalmitis, 121=Myopic choroidal degeneration, 420=Iridocyclitis, 330=Corneal ulcers, 620=Retinitis, 630=Choroiditis, 650=Choroidal hemorrhage, 660=Retinal degeneration, 670=Arteriosclerotic retinitis, 710=Optic atrophy, 72=Diabetes, 74=Arteriosclerosis.

Abbreviations: HM=Hand motion. CF=Count fingers. LP=Light perception.

‡Measured by simple method explained in text, page 47.

†Compass of visual field within which the direction of points of light held before the eye can be seen.

**Macular function was described by a variety of terms, many of them inexact and difficult to interpret.

Three failures were owing to preexisting retinal detachment. In one of these (Case 13, Table 5) neither macular function nor light projection was recorded. In another (Case 18) there was no macular function present before operation but there was a light projection field of 120°. The patient had diabetes. The prognosis was doubtful, but operation was resorted to in light of the extreme handicap of the individual. In the third case of retinal detachment (Case 22) macular function was reported as "two-point light discrimination at 1 cm." As the distance of the light from the eye was not stated, there is no information upon which to estimate the extent of functioning retina in the macular area. Light projection was recorded as 100°. Visual acuity before operation was 10/200; after operation, light perception only.

In three cases failure was owing to arteriosclerotic retinitis. In two of these the internist diagnosed widespread arteriosclerosis in the preoperative report. In only one of these cases (Case 1, Table 5) was an effort made to record a precise estimate of macular function. The report of "two-point light discrimination at 1 inch" is again inadequate. The statement "two light horizontal" has no precise significance. Apparently "good" in the third case was inaccurate.

Diabetic retinitis was the cause of failure in one case (Case 2). Macular function and light projection were recorded as normal. It is possible that retinal lesions developed between the date of the presurgical examination and the final refraction.

In another case (Case 4) failure was owing to retinal degeneration. Visual acuity before and after operation was 20/200. The postoperative report indicated senile macular degeneration. The patient, 79 years of age, had other symptoms of senile mental degeneration. The measured distance of two point light discrimination was 5 mm. at 2 feet from the eye, and light projection of 130° was recorded. This was the basis of a good prognosis. In this case six months intervened between the preoperative and the postoperative reports. Progress of the retinal lesion during that interval is a probability.

One failure was owing to myopic choroiditis (Case 8). The patient, aged 74, could see hand motions before operation and had light perception postoperatively. Macular function was recorded as "normal" and light projection as 70°. The estimate of "normal" was not substantiated by the postoperative results.

In these 13 failures it would appear that the preoperative record did not accurately state macular function. In the only case in which there seemed to be an accurate and complete record of preoperative findings (Case 4) failure to improve vision was owing to progress of systemic disease in addition to the ocular condition. Question is raised as to whether a more scientific method of estimating and recording macular function would have influenced the appraisal of prognosis in these cases.

Table 6 lists 28 cases in which visual acuity was improved to 20/200 or less. A prognosis of "questionable" based upon impaired two-point light discrimination and, in three cases, impaired light projection, was substantiated in nine of these cases (Nos. 4, 6, 9, 10, 13, 14, 20, 21, and 22). In Case 4, "very poor" macular function was recorded. Postoperative examination revealed chorioretinitis; visual acuity was 10/200. In Case 6 two-point light discrimination at 18-inch separation was recorded, but the distance of the light from the eye was not indicated. This was the basis of a questionable prog-

TABLE 4.—*Failures owing to postoperative complications*

Case No.	Age	Visual acuity		Pathologic Condition*	
		Preop.	Postop.	Eye	Systemic Preop.
9	68	L.P.	L.P.	650	.....
17	71	C.F.	No L.P.	650	.....
21	67	L.P.	L.P.	650	72-74
23	69	L.P.	L.P.	650	.....
5	75	L.P.	L.P.	420	.....
10	86	L.P.	L.P.	420	72
11	67	H.M.	L.P.	420	.....
19	77	L.P.	L.P.	420	72-74
14	72	L.P.	No L.P.	330	.....
25	64	20/200	L.P.	Epithelial ingrowth	.....
3	89	L.P.	No L.P.	130	.....
12	77	L.P.	L.P.	.....	.....

*See Table 3 for explanation of code numbers.

Abbreviations: LP=Light perception. CF=Count fingers. HM=Hand motion.

TABLE 5.—*Failures owing to ocular disease present before operation*

Case No.	Age	Macular* Function	Light Projection**	Visual Acuity		Pathologic Condition†	
				Preop.	Postop.	Eye	Systemic
6	71	.....	.....	L.P.	L.P.	110	
7	72	Normal	Normal	20/400	20/400	110	
15	69	Good	Normal	L.P.	L.P.	110	
24	71	10 mm.	125°	20/100	L.P.	110	
13	64	.....	.....	L.P.	L.P.	640	
18	60	No	120°	L.P.	L.P.	640	72
22	62	1 cm.	100°	10/200	L.P.	640	
1	82	1 inch	80°	1/200	5/200	670	74
16	81	2 light horizontal	.....	H.M.	H.M.	670	74
20	79	Good	.....	L.P.	C.F.	670	
2	64	Normal	Normal	H.M.	3/200	620	72
4	79	5 mm. at 2 feet	130°	20/200	20/200	660	
8	74	Normal	70°	H.M.	L.P.	121	

†See Table 3 for explanation of code numbers.

**Compass of visual field within which the direction of points of light held before the eye can be seen.

*Macular function was described by a variety of terms, many of them inexact and difficult to interpret.

Abbreviations: LP=Light perception, HM=Hand motions.

TABLE 6—*Cases in which visual acuity was improved to 20/200 or less*

Case No.	Visual Acuity Preop.	Visual Acuity Postop.	Pathologic Condition* Postop. Eye	Pathologic Condition* Preop. Systemic	Macular Function**	Light Projection†	Preop. Prognosis
1	L.P.	20/200	.....	....	5 cm. at 1 m.	110°	
2	L.P.	20/200	710	74	1 inch at 20 feet	Full	
3	L.P.	20/200	630	....	Present	Full	
4	L.P.	10/200	630	....	Very poor	90°	Questionable
5	H.M.	20/200	670	....	½ cm. at 1 m.	100°	
6	L.P.	20/300	660	....	18 inches		Questionable
7	H.M.	10/200	630	....	1 cm.	Good	
8	L.P.	20/200	620	....	1 cm.	120°	
9	H.M.	20/200	660-91	....	1-2-4° R&W	20°	Questionable
10	L.P.	3/200	.....	....	W&W 3 cm. at 13 inches	Full	Questionable
11	L.P.	20/400	620-72	....	Good	Fair	
12	H.M.	20/200	620	....	Good	Good	
13	H.M.	20/200	110	....	Uncertain	Restricted	Questionable
14	H.M.	20/200	640	....	Uncertain	Uncertain	Questionable
15	L.P.	20/400	630	....	Satisfactory	Satisfactory	
16	L.P.	20/400	.....	....	5 cm. at 1 m.	110°	
17	H.M.	20/200	670	....	.....		
18	L.P.	20/200	670	....	1 inch at 1 m.	Good	
19	L.P.	20/300	110	....	2 cm. at 1 m.	Full	
20	L.P.	20/200	620-72	....	2-4° R&W	Full	Questionable
21	L.P.	10/200	340	....	Impaired	Good	Questionable
22	L.P.	20/200	.....	....	No	80°	Questionable
23	L.P.	5/200	670	74	.....	80°	
24	H.M.	10/200	670	74	Normal	110°	
25	H.M.	20/200	121	....	3 cm.	90°	
26	L.P.	20/400	620	72	Normal	Normal	
27	H.M.	8/200	630	....	1 inch at 1 foot	90°	
28	C.F.	10/200	660	....	1 cm. at 1 m.	130°	

*See Table 3 for explanation of code numbers.
†Compass of visual field within which the direction of points of light held before the eye can be seen.
**Macular function was described by a variety of terms, many of them inexact and difficult to interpret.
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nosis. After operation visual acuity was 20/300, and retinal degeneration was noted.

Macular function was described as "1-2-4° red and white"† in Case 9, and light projection was limited to 20°. Postoperative examination revealed retinitis pigmentosa. Central visual acuity was 20/200. The restricted field was diagnosed before operation.

In Case 10 two-point light discrimination was recorded as "3 cm. at 13 inches" and light projection as "full field." Prognosis was questionable. Postoperative visual acuity was 3/200 with no ocular pathologic condition to account for the impairment. The patient was well satisfied with the improvement.

In Case 13 "uncertain" macular function and "restricted" light projection were recorded preoperatively. After operation, visual acuity was 20/200 and glaucoma was present.

Macular function and light projection were recorded as "uncertain" in Case 14. Detached retina was noted on postoperative examination. Central visual acuity was 20/200.

In Case 20 macular function was recorded as 2-4° red and white, and light projection as "full fields."

†This description of function and the method used to determine it are explained later in this presentation.

Impaired macular function was verified by the postoperative examination in which diabetic retinitis was noted.

Impaired macular function and good light projection were recorded in Case 21. Postoperative vision was 10/200. Corneal dystrophy was noted. In Case 22 inability to make two-point light discrimination was recorded, and the light projection field was 80°. Prognosis was questionable. Postoperative visual acuity was 20/200 and there was no apparent pathologic condition of the eye to account for the impaired vision.

Two-point light discrimination was recorded in Cases 7, 8 and 25 but the distance of the light from the eye was not stated. In those cases lesions in the fundus were observed after operation.

In two cases (17 and 23) no estimate of macular function was recorded. Arteriosclerotic retinitis was noted after operation and in both the visual acuity was less than 20/200.

In the other 14 cases in which visual acuity was not improved to more than 20/200 the preoperative prognosis was good, based upon either a specified measured two-point light discrimination at a specified distance or a statement that it was "good," "present," "normal," or "satisfactory." However, fundal disease was noted at postoperative examina-

tion. Here, again, would a better estimate of macular function have contributed to a more accurate appraisal of prognosis?

Pathologic change involving the fundi was noted at postoperative examination in 34 cases in which visual acuity was better than 20/200. In one of those cases the preoperative report indicated "poor" macular function. After operation visual acuity was 20/100 and the presence of retinitis was noted. Macular function was not reported in one of the cases but in all of them visual acuity was better than 20/200 and visual fields were greater than 20° after operation. The various pathologic conditions noted at postoperative examination and the incidence of each were as follows: Arteriosclerotic retinitis, 10; diabetic retinitis, 6; choroiditis, 6; retinal degeneration, 5; glaucoma, 3; myopic choroidal degeneration, 2; optic atrophy, 2.

In 32 of these 34 cases (the two exceptions were previously noted) a satisfactory measured macular function or a description of it as "normal," "good," or "satisfactory," was recorded. This would indicate that present tests for macular function and light projection do not supply adequate indication of the presence of fundal lesions.

Does the absence of two-point light discrimination contraindicate operation? Table 7 lists the postoperative results in 16 cases in which the preoperative report indicated that the patient did not have two-point light discrimination. In all but three cases, however, good light projection was present. In Case 2 (Table 7) light projection was recorded as "inaccurate," and in Cases 10 and 11 it was not recorded. In only one of the 16 cases did operation fail to restore useful vision. In that case, "good light

TABLE 7.—*Postoperative results in cases in which no macular function was present*

Case No.	Macular Function**	Light Projection†	—Visual Acuity— Preop.	Postop.	Ocular Disease*
1	No	Good	L.P.	L.P.	640
2	No	Inaccurate	L.P.	20/40	
3	Absent	Accurate	L.P.	20/200	
4	No	95°	L.P.	20/50	670
5	No	80°	L.P.	20/200	
6	No	140°	L.P.	20/60	
7	No	80°	H.M.	20/70	670
8	No	65°	L.P.	20/30	
9	Doubtful	60°	H.M.	20/70	670
10	Too Dense	.....	L.P.	20/20	
11	Negative	.....	L.P.	20/30	630
12	No	90°	L.P.	20/30	
13	No	Full	L.P.	20/25	
14	No	140°	L.P.	20/25	
15	No	120°	H.M.	20/20	
16	No	120°	L.P.	20/50	

*See Table 3 for explanation of code numbers.

†Compass of visual field within which the direction of points of light held before the eye can be seen.

**Macular function was described by a variety of terms, many of them inexact and difficult to interpret.

Abbreviations: LP=Light perception, HM=Hand motions.

TABLE 8.—*Data on 60 cases in which function of retina was determined preoperatively by "1-2-4° red and white" test (Details of test, page 47)*

Case No.	Macular Function	Light Projection*	—Visual Acuity— Preop.	Postop.	Ocular and Systemic Disease*
1	1-2-4° R&W	Full	3/200	20/30	
2	1-2-4° R&W	Full	C.F.	20/25	
3	1 cm. R&W	Full	3/400	20/20	
4	1-2-4° R&W	Full	20/200	20/60	
5	R&W at 3 cm.	Full	1/200	20/30	
6	1-2-4° R&W	Full	C.F.	20/20	
7	1-2-4° R&W	Full	L.P.	20/30	
8	1-2-4° R&W	Full	H.M.	20/20	
9	1-2-4° R&W	Full	C.F.	20/20	
10	1-2-4° R&W	Full	L.P.	20/50	
11	1-2-4° R&W	Full	H.M.	20/20	
12†	1-2-4° R&W	Restricted	L.P.	20/100	
13	R&W at 3 cm.	Limited	L.P.	20/30	
14	1-2-4° R&W	Full	6/200	20/40	
15	1-2-4° R&W	Full	C.F.	20/20	
16	R&W at 3 cm.	Full	L.P.	20/50	
17	1-2-4° R&W	Full	H.M.	20/20	
18	R&W at 3 cm.	Full	L.P.	20/25	
19	1-2-4° R&W	Full	1/200	20/30	
20	1-2-4° R&W	Full	H.M.	20/30	
21	1-2-4° R&W	Full	2/200	20/25	
22	R&W at 3 cm.	Full	H.M.	20/30	
23	1-2-4° R&W	Full	C.F.	20/20	
24	1-2-4° R&W	130°	L.P.	20/60	
25†	1-2-4° R&W	20°	H.M.	20/200	660-91
26	1-2-4° R&W	Full	3/200	20/40	
27	R&W at 1 cm.	Full	L.P.	20/25	
28	1-2-4° R&W	Full	L.P.	20/30	
29	1-2-4° R&W	Full	L.P.	20/20	
30	1-2-4° R&W		L.P.	20/30	660
31	2-4° R&W	Full	H.M.	20/20	
32	R&W at 4 cm.	110°	L.P.	20/25	
33	R&W at 3 cm.	Full	1/200	20/40	
34	1-2-4° R&W	Good	L.P.	L.P.	420-72
35‡	1-2-4° R&W	Impaired Upper & Temporal	3/200	5/200	121-640
36	1-2-4° R&W	Full	2/200	20/20	670
37	1-2-4° R&W	Full	2/200	20/20	
38†	2-4° R&W	Full	L.P.	20/200	620-72
39	1-2-4° R&W	Full	L.P.	20/25	
40	1-2-4° R&W	Full	10/200	20/20	
41	R&W at 3 cm.	Full	H.M.	20/20	
42	1-2-4° R&W	Full	5/200	20/20	
43†	1-2-4° W only	Full	L.P.	20/200	660
44	R&W 3 cm.	Full	L.P.	20/25	
45	1-2-4° R&W	Full	1/200	20/50	620-72
46	R&W 3 cm.	Limited	H.M.	20/20	
47	1-2-4° R&W	Full	H.M.	20/25	
48	R&W 3 cm.	Full	H.M.	20/70	
49	R&W 3 cm.	120°	2/200	20/20	
50	R&W 3 cm.	Full	H.M.	20/25	
51	R&W 3 cm.	Full	3/200	20/20	
52	R&W 3 cm.	Full	16/200	20/50	630
53	R&W 6 cm.	Full	20/200	20/20	630
54	R&W 3 cm.	Full	1/200	20/30	
55	R&W 3 cm.	Full	H.M.	20/20	
56	1-2-4° R&W	Normal	20/200	20/50	
57	1-2-4° R&W	Normal	H.M.	20/20	
58	1-2-4° R&W	110°	L.P.	20/30	
59	1-2-4° R&W	Full	H.M.	20/50	
60	R&W 3 cm.	Full	1/200	20/30	

*See Table 3 for explanation of code numbers.

Preoperative Prognosis: †Questionable. ‡Poor.

Abbreviations: LP=Light perception, HM=Hand motions, CF=Count fingers.

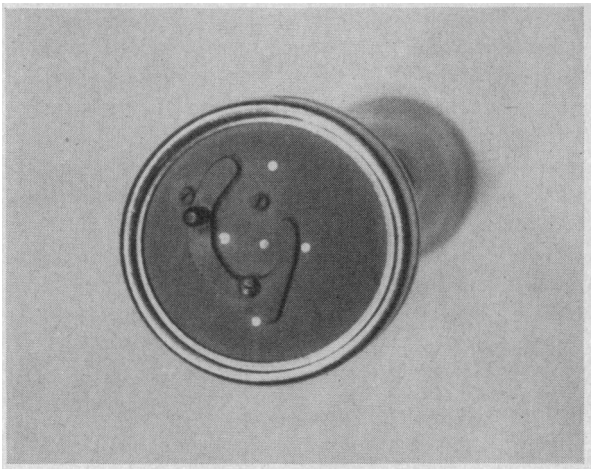

Figure 1.—Simple device for determination of macular function and compass of light perception. A perforated disc with a shutter so hinged that some of the holes can be occluded as necessary, it is mounted over the lens of a flashlight.

projection" was reported before operation, but retinal detachment was noted postoperatively and visual acuity remained as it was before. Visual acuity in two cases (3 and 5) was improved to only 20/200. No pathologic condition to which the limited result could be ascribed was noted in either of them.

The results would indicate that the absence of two-point light discrimination when light perception and good light projection are present does not foreclose hope that useful vision can be restored.

Does a more precise examination of macular function and light projection supply information upon which a more reliable prognosis can be established? Table 8 lists 60 cases in which beams of white and red light were used to establish an angular measurement of functioning retina. The equipment and methods of procedure will be described later in this discussion.

In one case (Case 34, Table 8) in which the preoperative prognosis was good the operation failed, owing to the development of iridocyclitis postoperatively. The patient was diabetic. Visual acuity both before and after operation was "light perception." Red and white discrimination of 1-2-4° was reported in Case 25, but light projection was limited to 20°. The prognosis was stated as "questionable" and the result showed that the doubt was warranted; visual acuity was improved to only 20/200 and retinitis pigmentosa was diagnosed postoperatively. Red and white discrimination was only 2-4° in Case 38. Light projection was described as "full field." Postoperative examination revealed diabetic retinitis. Visual acuity was 20/200. In Case 43 there was 1-2-4° white light discrimination but no recognition of red. Retinal degeneration was noted at postoperative examination. Visual acuity was 20/200.

In Case 35 the patient had 1-2-4° red and white light discrimination but impaired light projection in the upper and temporal fields and the prognosis was deemed poor. The patient insisted upon operation. Upon postoperative examination myopic chorioiditis was noted. Two years later retinal detachment occurred. The patient in Case 12 had 1-2-4° red and white discrimination with restricted light projection fields. The prognosis was "questionable." Visual acuity after operation was 20/100 and no definable retinal lesions were noted.

The prognosis was good in 55 of the 60 cases in which angular measurement of macular function, color discrimination tests and careful delineation of light projection fields were carried out. In 54 of them useful vision was present at the time of postoperative examination. The one failure was owing to postoperative iridocyclitis.

SIMPLE PROCEDURE TO DETERMINE EXTENT OF FUNCTIONAL RETINA

When the program for visual rehabilitation was first started in 1940, the State Ophthalmologist was called upon to examine applicants for removal of cataracts in all 58 counties of the state. Portable equipment designed to facilitate and simplify the examination wherever possible without sacrificing accuracy became necessary. The expense involved in transportation of the patient to the surgical centers made the preoperative prognosis of major importance. A simple, standardized test to investigate and record macular function and light projection was essential. Descriptions of the "home made" equipment used in making the preliminary examinations were soon requested by the cooperating ophthalmologists. Later, Parsons Optical Laboratories, 518 Powell Street, San Francisco, made the equipment available to the profession.

The method and the equipment combine the use of red and white beams of light in accord with the suggestions of Fuchs and Duke-Elder. A bakelite disc perforated by five holes is placed over the lens of a flashlight of convenient size (Figure 1). The light is designed for use at 13 inches from the eye. All the holes are 1 mm. in diameter and are so placed as to subtend an angle of 1°, 2°, and 4° when held 13 inches from the eye. The central hole has a red cover. Six millimeters on each side of the central red light are holes that transmit white light. Two holes are placed 12 mm. from the red on an axis of 90° from the line connecting the two white light openings and the red light opening previously mentioned. The distance for 1° at 13 inches is arrived at by using the natural tangent of 1° (.01746) multiplied by the distance, 13 inches (333 mm.). This equals 5.8141 mm. Six millimeters

is the nearest practical measurement for construction purposes. The distance of 12 mm. is derived in the same manner. An occluder is so mounted on the disc as to enable the operator to occlude all white lights when desirable. An ordinary pencil flashlight with a black hood perforated by a hole 0.5 mm. in diameter is used as an accessory light to determine the light projection. In use the light with all holes open is held 13 inches from the eye in a dark room. If the patient readily recognizes the one red and four white lights, the record is entered as "1-2-4° red and white light discrimination." This would indicate functioning retina, 1°, 2°, and 4° from fixation. Inability to recognize red or the 1° light may indicate impaired macular function. Inability to recognize any of the lights may indicate a cataract too dense to transmit individual rays of light. In this condition the occluder is adjusted to close the four white openings. The red is then used for fixation and the accessory light is used to determine the minimum distance of separation at which two lights are recognized. This is recorded as red and white at the distance between the two lights. Example: Red and white at 4 cm. The red light is also used for fixation, and the accessory light is used in determining the extent of the light projection fields.

This equipment has proven useful, it is inexpensive, and the results obtained are more reliable than some of those obtained by more elaborate procedures.

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